Herbert W. Holland
2314 Chimney Rock Road
Houston, Texas 77056
Fax: (713) 266-6409

Herbert W. Holland

Fax

To:	Ms. Janet Higgins	**From:**	Herb Holland
Fax:	(703) 746-4625 703 305 9372	**Pages:**	5
Phone:	(703) 308-6187	**Date:**	6/8/2004
Re:	Pages 11-14 application # 10/038/018	**CC:**	

☐ **Urgent** ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☐ **Please Recycle**

• **Comments:**

Ms. Higgins,

Thank you for your message this morning.

The following pages are pages 11-14 of the specification of US patent application # 10/038,018.

Please let me know if you have any questions. I will follow this fax with a telephone call to confirm your receipt of the requested information.

Best Regards,

Herb Holland

713.206.6730 cell phone

713.266.4908 home phone

While a specific electrode plate configuration of a prior art device may attain a desired level of contaminant separation for a specific fluid column, changes in composition of a feed stream often require modifying the spacing of the electrodes within the prior art device, or substituting another reactor having a different plate spacing configuration, in an attempt to reach desirable levels of fluid treatment as the makeup of the feedstock varies. Such modifications are time consuming and often result in suspension of fluid treatment while a suitable reactor configuration can be found. Therefore, use of many prior art contaminant separation reactors with feed streams of constantly varying composition is typically labor intensive and time consuming for effective treatment.

The reactor of the first embodiment of the instant invention is configured to provide treatment of a broad range of soluble and suspended contaminants from a variety of fluid columns. The reactor includes a housing defining an interior chamber established by a fluid impervious boundary wall with an inner surface and having inlet and outlet ports, and two opposing electrodes, each electrode comprising a plurality of parallel, spaced apart plates of an electrically conductive material coupled to a common buss bar wherein the spacing between the plates is non-uniform. Each electrode receives an opposite electrical charge, either positive or negative, from a power supply. A fluid column entering the inlet port of the reactor may be directed to follow a flow path formed by the opposing electrodes. The substantially parallel array of plates forming the flow path through the reactor are electrically charged with the first plate having an opposite charge from the second plate, the second plate having an opposite charge from the third plate, and so on. In this configuration, every plate forming the flow path through the reactor is connected to a common buss bar receiving an electrical charge opposite the charge provided to an adjacent plate.

The electrodes of the first embodiment of the instant invention may typically be arranged within the interior chamber of the housing as opposing electrodes with the plates of the electrodes being oriented orthogonal to the inlet and outlet ports. The plates of the opposing electrodes interleave in a parallel orientation to define a flow path from the inlet port to the outlet port and form a series of cavities of non-uniform volume. As such, the flow path of a fluid is substantially orthogonal to the direction of the electrical field established between opposing electrode plates.

By arranging the electrode plates within a housing in such an orientation, a fluid flowing through the interleaved array of oppositely charged electrode plates is exposed to a variety of electron flux between the surfaces of the opposing electrode plates and along the edges of the plates. Once a fluid column enters the reactor and begins flowing between the electrodes, the spacing between the parallel plates is graduated so that the volume of the cavities between the opposing electrodes progressively increases. Thus, as a fluid column flows along a flow path extending substantially parallel to the surface of each electrode plate and approaches the outlet port of the reactor, the volume of each cavity along the fluid flow path through the housing progressively increases from the inlet port to the outlet port. Graduated spacing between the electrode plates allows for treatment of a broad range of contaminants from a variety of fluid columns due to the varying levels of electromagnetic fields, ionization, electrolysis and free radical formation provided within the fluid flow cavities. The fixed array of electrons having a graduated spacing configuration overcomes the deficiency of prior art devices that require replacing one reactor with another having different electrode configurations or opening a reactor to rearrange movable electrode plates to provide an electrode configuration to effectively treat a feedstock that constantly varies in composition.

A feedstock may be directed to flow through the variably spaced electrodes of the instant invention so as the feed stream passes through each fluid flow cavity of a reactor, the volume of each cavity along the fluid flow path through the housing progressively increases from the inlet port to the outlet port. Further, in contrast to the laminar flow provided by the reactors of many prior art devices, the flow path through the graduated spacing of parallel plates and buss bars forming the electrodes of the instant invention provides for increased turbulence within the fluid column as it passes through the reactor. Turbulence within the reactor significantly increases the incidence of surface contact of the fluid column with the charged electrodes and provides the feed stream with exposure to the varying levels of electrical charges between the electrode plates.

The second embodiment of the contaminant separation reactor of the instant invention includes a plurality of contaminant separation sectors disposed in a substantially coplanar array within a single housing. Individual contaminant separation sectors are configured to replicate the surface area and quality of treatment typically attained by small laboratory reactor cells. As used herein, a contaminant separation sector shall mean a distinct fluid treatment unit comprising a pair of electrodes, each electrode comprising a plurality of parallel, spaced-apart plates of an electrically conductive material coupled to a common buss bar wherein the spacing between the plates of each contaminant separation sector is uniform. A contaminant separation sector may be connected to a supply of electrical power or other contaminant separation sectors. Each electrode of a sector may receives an opposite electrical charge, either positive or negative, from a contaminant separation power supply or an electrode of an adjacent sector so that in each sector, the substantially parallel, spaced-apart array of plates are electrically charged with the

first plate having an opposite charge from the second plate, the second plate having an opposite charge from the third plate, and so on.

A plurality of contaminant separation sector may be disposed within a reactor housing defining an interior chamber established by a fluid impervious boundary wall with an inner surface and having inlet and outlet ports, so that a fluid flowing through the housing may move substantially parallel to the facing surfaces of the opposing electrodes. As such, the fluid flow path extends substantially orthogonal to the direction of the electrical field established between opposing electrode plates. Further, arranging the electrode plates of the contaminant separation sectors in such an orientation to the fluid flow path allows the substantial amount of electron flux concentrated along the edges of the electrode plates to provide for increased intensity of electron flow through a fluid column.

Connections between contaminant separation sectors disposed within the housing and the power supply form an electrical circuit. A fluid column entering the inlet port of the reactor may be directed to flow through the evenly spaced parallel array of plates of the initial contaminant separation sector within the housing and then be directed to flow through subsequent contaminant separation sectors disposed within the housing.

In many instances it may be desirable to place static mixing apparatus within the reactor housing to disrupt any laminar flow that may result from a fluid column passing between parallel arrays of plates. Static mixing apparatus may be also be utilized to redirect a feedstock flowing near the internal wall of a housing to the charged electrodes for treatment. Further, a parallel array of plates comprising the